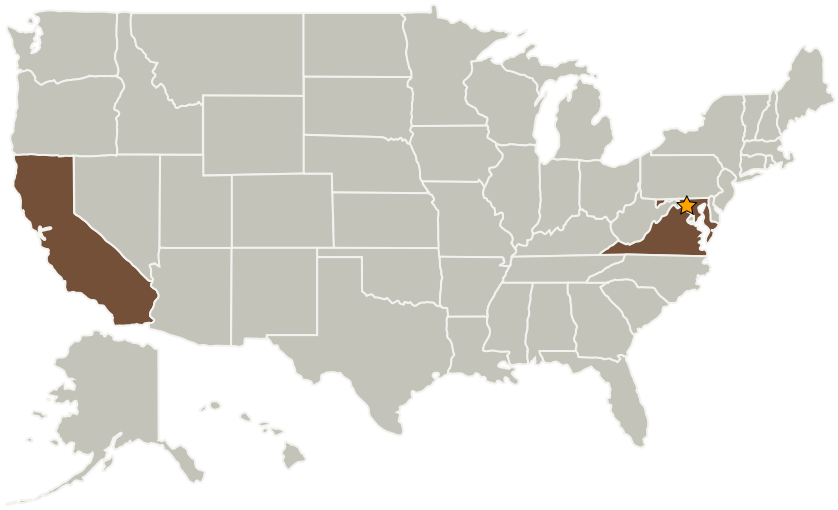
EUV Photon Sieves for Milli-Arcsecond Imaging of the Solar Corona

Completed Technology Project (2018 - 2021)

Project Introduction

A photon sieve is a variant of a Fresnel zone plate that can achieve diffraction-limited angular resolution in the extreme ultraviolet (EUV). Existing EUV instruments such as SDO/AIA and Hi-C are reflecting telescopes, and fall short by an order of magnitude or more from achieving the diffraction limit, because the mirrors cannot be figured to the requisite accuracy. Photon sieves offer the ability to obtain diffraction-limited EUV images using imaging elements with greatly relaxed manufacturing tolerances: sub-micron as opposed to the sub-nanometer requirements for conventional telescopes. Furthermore, sieves can isolate strong EUV emission lines for a wide range of temperatures in the solar atmosphere, including eruptive events. The unprecedented resolution achieved will allow us to observe individual dissipation regions in the solar corona and at last understand how the corona is powered. Understanding the heating of coronal plasmas and solar eruptive events are at the heart of NASA's strategic goal to Understand the Sun and its interactions with Earth and the solar system. Therefore, we propose to manufacture large-aperture photon sieves, demonstrate diffraction-limited EUV imaging in the laboratory, and perform environmental testing of the sieves for space flight.

Primary U.S. Work Locations and Key Partners



EUV Photon Sieves for Milli-Arcsecond Imaging of the Solar Corona

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destination	3

EUV Photon Sieves for Milli-Arcsecond Imaging of the Solar Corona

Completed Technology Project (2018 - 2021)

Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Wallops Island	Supporting Organization	Industry	Wallops Island, Virginia

Primary U.S. Work Locations	
California	Maryland
Virginia	

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Heliophysics Technology and Instrument Development for Science

Project Management

Program Director:

Roshanak Hakimzadeh

Program Manager:

Roshanak Hakimzadeh

Principal Investigator:

Adrian N Daw

Co-Investigators:

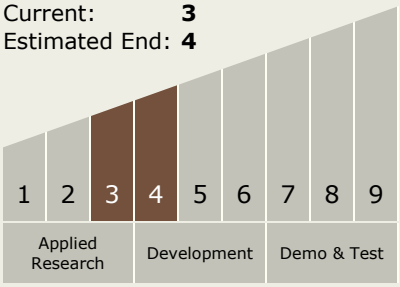
Donald J Schmit
Douglas M Rabin
David T Leisawitz
Thomas R Widmyer
Kevin L Denis

EUV Photon Sieves for Milli-Arcsecond Imaging of the Solar Corona

Completed Technology Project (2018 - 2021)

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.3 Distributed Aperture

Target Destination

The Sun